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Zeit: Mittwoch 17:00–17:45

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Particle-induced Oscillations in an Inductively Coupled Plasma — •MARTIN SCHULZE and ACHIM VON KEUDELL — Arbeitsgruppe Reaktive Plasmen, Ruhr-Universität Bochum

Various unique physical properties of nanometer-sized particles make them interesting for many technological applications. The effect of dust formation in low-temperature plasmas might be exploited to develop a new kind of particle source, however, the qualities of the particles are difficult to control. The feasibility of particle-induced oscillations between different heating modes as a tool to monitor and to control particle sizes and densities is being investigated.

The experiments are conducted in a GEC-cell like inductively coupled plasma (ICP) reactor. Oscillations of the plasma emission with a frequency of up to several ten Hz can be observed in different rare gas discharges in the presence of nanometer-sized particles grown during the injection of a pulse of acetylene.

This contribution presents timely and spatially resolved langmuir probe and optical emission spectroscopy (OES) measurements of the oscillations. Furthermore, ex-situ measurements of the particle size distribution and density from atomic force microscopy (AFM) and scanning electron microscopy (SEM) are shown. The evolution of the electron temperature and density calculated from the probe and OES data provide an insight into the physical nature of the instability. With the help of the AFM- and SEM-measurements the correlation between oscillation frequency and particle size distribution is explored.

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Staubakustische Wellen in anodischen Plasmen — •THOMAS TROTTERBERG, DIETMAR BLOCK und ALEXANDER PIEL — Institut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität Kiel, 24098 Kiel

Mikrometergroße Partikel können in schwach magnetisierten anodischen Plasmen gefangen werden. Das anodische Plasma wird dabei als sekundäres Plasma eingebettet in einem primären HF-Plasma erzeugt. In dem hier vorgestellten Experiment werden Partikelwolken von typischerweise 1 bis 3 cm Länge mittels Kamerabeobachtung untersucht. Dabei treten selbsterregte niederfrequente Wellen (20-30 Hz) auf, die an der Anodenseite der Wolke entstehen und sich von der Anode weg ausbreiten. Bei sinusförmiger Modulation der Anoden Spannung kann die Frequenz der Welle in einem weiten Bereich synchronisiert werden, was die Bestimmung einer Wellendispersion und deren Vergleich mit theoretischen Modellen erlaubt. Erstmals widmen wir uns der über die Länge der Wolke veränderlichen Wellenlänge. Dazu kommt eine in dem Gebiet der staubigen Plasmen neuartige Analysetechnik zur Anwendung, nämlich die Singularwertzerlegung (SVD). Es wird gezeigt, dass die räumlich variable Wellenlänge sich nicht allein mit der beobachteten schwachen Inhomogenität der Staubdichte und damit der Staubplasmafrequenz erklären lässt. Andere Ursachen zur Erklärung dieses Phänomens werden diskutiert.

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Plasma polymerized nanoparticles as astroanalog material — •EVA KOVACEVIC¹, ILIJA STEFANOVIĆ¹, JOHANNES BERNDT¹, HANS-WERNER BECKER², CHRISTOPH SOMSEN³, YVONNE J. PENDLETON⁴, and JÖRG WINTER¹ — ¹Institut für Experimental Physik II, Ruhr Universität Bochum — ²Institut für Experimental Physik III, Ruhr Universität Bochum — ³Institut für Werkstoffe, Ruhr Universität Bochum — ⁴NASA Ames Research Center, Moffett Field, CA, USA

Carbonaceous compounds are a significant component of interstellar (IS) dust and the composition and structure of such materials is therefore of key importance. Our plasma polymerization process has similarities to stellar outflow conditions and provides a convenient way to make carbonaceous IS analogs under controlled conditions and to compare their characteristics to astronomical observations. We report about experiments in low temperature plasmas with low ionized buffer gases (like Ar or He). Such plasmas provide an excellent trap for the nanoparticles ("plasma matrix isolation"), enabling investigations of the UV extinction feature, scattering measurements as well as manipulation of the particles, e.g. with atomic hydrogen. The chemistry of polymerization can be followed in-situ by means of mass spectroscopy, optical spectroscopy, and IR spectroscopy (from near to far IR region). The role of the carrier gas on the polymerisation is of great interest for the dusty plasma

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community, especially in the case of gases undergoing copolymerization. An example is N₂/C₂H₂ plasma where nitrogen has a double role: as carrier gas and as potential partner forming multicomponent monomer. This study is supported by DFG within SFB 591 (B1,B5).